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Decoding Agricultural Growth: The Influence of Public Capital Expenditure, Productivity and Employment on Sectoral GVA

***Rupsa Maitra[1], Dr. Kalpana Sahoo[2]**
[1,2]Rama Devi Women's University, Bhubaneswar, Odisha 751022; India.

Abstract
Agriculture's share to the GVA has been on a declining trajectory for the last decade. However, agriculture remains a vital part of the economy, employing a significant portion of the workforce. As of FY 2022-23, agriculture contributed approximately 15% to India's GVA, down from 35% in 1990-91, illustrating the ongoing structural transformation of the economy toward industrial and service sectors. Despite this, the sector still employed about 45% of the total workforce in 2022, highlighting its pivotal role in rural livelihood. This paper aims to analyze the direct effect of agricultural productivity on the contribution of agricultural sector to the Gross Value Added (GVA). It also studies the relationship between agricultural productivity and employment share in the agriculture sector, challenging the conventional assumption that a higher percentage of working population in any sector correlates with its economic output. Besides, it investigates the role of, employment share in influencing the relationship between agricultural productivity and its contribution to GVA. This study provides valuable insights into the evolving role of agriculture in transforming the economy as well emphasizes on the need of balanced economic policies which can ensure the sector's sustainability, equity in workforce distribution and its contribution to the national economy in the future.
Keywords: *Agricultural Productivity Labour Work Force Participation Sectoral Contribution GVA*

INTRODUCTION

Five decades ago, a slight fluctuation in the growth of agricultural sector could determine a country's prosperity or downfall. However, in today's world agriculture is no longer the sole driving force behind a nation's development. After independence India's focus on agriculture through 1st 5 year plan followed by Green Revolution during the 3rd 5 year plan made India self-sufficient. After achieving food security focus shifted towards industrial and service sector growth. By the 1990s agriculture was stable, allowing India to shift focus on heavy industry through 2nd 5 year plan which led to accelerated growth of industries reducing the dominance of agriculture.

1980 onwards the industrial sector expanded but service sector outpaced it in growing and exploded after 1991 due to economic reforms like Liberalization, Privatization, and Globalization. Since then India's services sector has been the steadiest contributor to the Gross Value Added (GVA) of the economy. Its contribution to the total GVA at current prices has increased from 50.6% in FY14 to about 55% in FY25 (Ministry of Finance, 2025). In today's India service sector is the primary driver of the economy contributing significantly to the GDP.

As India transitioned from an agrarian to an industrial and service-driven economy, workforce participation patterns evolved, influencing economic productivity in distinct ways. The expansion of the service sector, driven by economic reforms and technological advancements, reshaped employment structures and labor force distribution. Agriculture: Employs a significant portion of the population but contributes a smaller percentage to GDP. Industry: Has a balanced employment-to-GDP contribution ratio. Services: Contributes the largest share to GDP with a comparatively smaller workforce.

This disparity highlights the varying productivity levels across sectors. In recent years, debates have emerged around the role of workforce participation in driving economic growth, with some studies suggesting that increased labor force engagement should enhance economic productivity, while others indicate that the nature and quality of employment may lead to unexpected outcomes (*Autor, D. H. et. al. 2003; Katz, L. F., & Autor, D. 1999).*

However, a significant portion of the population remains employed in agriculture 54.6% in India (Census 2011) and 55% in Odisha (Department of Agriculture and Farmer's Empowerment), underscoring the need for policies that enhance productivity and employment opportunities across all sectors. Hence understanding the intricate relationships between labour market dynamics and economic output is crucial for informed policymaking.

REVIEW OF LITERATURE

Worldwide several studies have examined the effect of investment and employment on the performance of agricultural sector. They have indicated mixed results, showing there is *direct positive relationship or direct negative relationship or no relationship at all*. (Alagh, April-June 1997) Counseled that *decline in public investment could limit agricultural productivity* focusing on India. Emphasizing investment is essential but must be backed by *policy reforms, institutional support and efficient delivery system* and suggesting that the real benefits of investment, often take time to show. (Nouran Abdelhamid Abdelgawwad, 4th August, 2023) Pointed that *investment and employment considerably boosts agricultural GDP*, especially over long time. This study also emphasized the importance of combining financial investment with training, infrastructure, and support services to maximize gains. Investment helps agriculture in the long term, but recurrent spending is not improving agriculture. (Racheal, December, 2019) Labour force helps in the short run but needs better use in long run. From the perspective of sectoral contribution to export of the Philippines (Pacinabao, April 2019) found that to improve agricultural exports the government needs to pay attention towards *controlling inflation, provide more funding and make good use of the workforce.*

(Sinha, 31 March, 2025) Found FDI *is not effective in helping agriculture growth* while GDP triggers agriculture sector's growth, suggesting better policies to make efficient capital usage. In many European countries agricultural productivity improved as employment declined portraying efficiency and technology matters more than the number of workers alone. (Megyesiova, 2021) Emphasized the need of modern tools and better resources to raise the agricultural sector's contribution to growth.

(Oinam Krishnadas Singh, 2021)Found that agricultural growth in Punjab leads to more government spending on agriculture which supports Wagner's law, as economy grows government spending also grows. Here the government is spending money after the agricultural sector grows in other words we get to see *agriculture induced investment*.

Most of the studies perform fragmented analysis; examines investment, employment, or productivity in separation but not their interlinked effects on agricultural GVA. Here, the mediating role also remains unexplored, few studies investigate, whether employment mediates the relationship between productivity and GVA or not. In light of these gaps, this study adopts a Structural Equation Modeling (SEM) approach to examine the interlinked effects of agricultural productivity, employment share, and sectoral contribution to GVA and to offers a comprehensive and empirically grounded analysis of the factors influencing agricultural sector performance.

DATA & METHODOLOGY

This study employed Structural Equation Modeling (SEM) to simultaneously estimate multiple regression equations capturing the direct, indirect, and mediating effects of time on Odisha's workforce participation rate and its influence on the Gross State Value Added contributed by agriculture and allied activities. For this purpose Secondary data from Odisha Economic Survey & Periodic Labour Force Survey was considered over a time period of 30 Years. (i.e. from 1993 to 2022).

Using data spanning over 30 time points, the analysis first models the trend in workforce participation as a function of time, thereby capturing the dynamic evolution of labor market engagement. The model then assesses how variations in the workforce participation rate influence GVA, a key indicator of economic performance. It represents a sequential process where $Yi=\beta0+\beta1\cdot Xi+\varepsilon1$ **G**ross State Value Added (Yi) is

modeled as a function of Workforce Participation Rate (Xi). Workforce Participation Rate (Xi) is modeled as a function of Time (Zi); $Xi=\gamma 0+\gamma 1 \cdot Zi+\varepsilon 2$. This structure enables the study to capture the dynamic evolution of labor market engagement and its subsequent impact on agricultural economic performance.
Secondly to evaluate whether public capital expenditure in agriculture significantly influences Gross State Value Added (GSVA) in Odisha Autoregressive Distributed Lag (ARDL) approach was adopted. Prior to which Dickey-Fuller test was used to determine stationarity of both Gross State Value Added by Agriculture (GSVA) and Capital Expenditure (CAPEX). Capital expenditure data (1993–2022) has been considered as a proxy for agricultural investment, where we aim to quantify its impact on sectoral growth.

$$GSVA_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \; GSVA_{t-i} \; + \; \sum_{j=0}^{q} \partial_i \; CAPEX_{t-j} + \; \varepsilon_t$$

Where: α_0 = constant term

β_i = coefficients of lagged GSVA
δ_j = coefficients of lagged CAPEX
ε_t = error term
t = time (year)

RESULT

A one-unit increase in the Workforce Participation Rate is associated with a decrease of about 0.396 units in Gross State Value Added, holding everything else constant. When Workforce Participation Rate is zero, the model predicts a Gross State Value Added of approximately 48.46 units. This negative relationship suggests that higher workforce participation does not necessarily translate into higher economic output in agriculture and allied sectors, potentially due to factors like underemployment or low productivity.

SEM	**Coefficient**	**Z**	**P-Val**
Contribution of Agriculture & Allied activity to GSVA	-.3957769	-3.72	0.000
Odisha's WPR	.68901	-1339.108	0.000

A one-unit increase in the year (for example, moving from one year to the next) is associated with an increase of about 0.689 units in the Workforce Participation Rate.
When year equals 0, the predicted Workforce Participation Rate is -1339.108 units. The positive coefficient (0.68901) indicates that over time, the Workforce Participation Rate is increasing.
The negative coefficient (-0.39578) indicates that higher Workforce Participation Rates are associated with lower Gross State Value Added. The model implies an indirect relationship between year and Gross State Value Added through Workforce Participation Rate. Even though year directly increases Workforce Participation Rate, that increase in turn is linked with a decrease in Gross State Value Added. This output provides valuable insights into how changes over time (year) influence the labor market (workforce participation rate) and, in turn, how these changes are associated with economic output (gross state value added).

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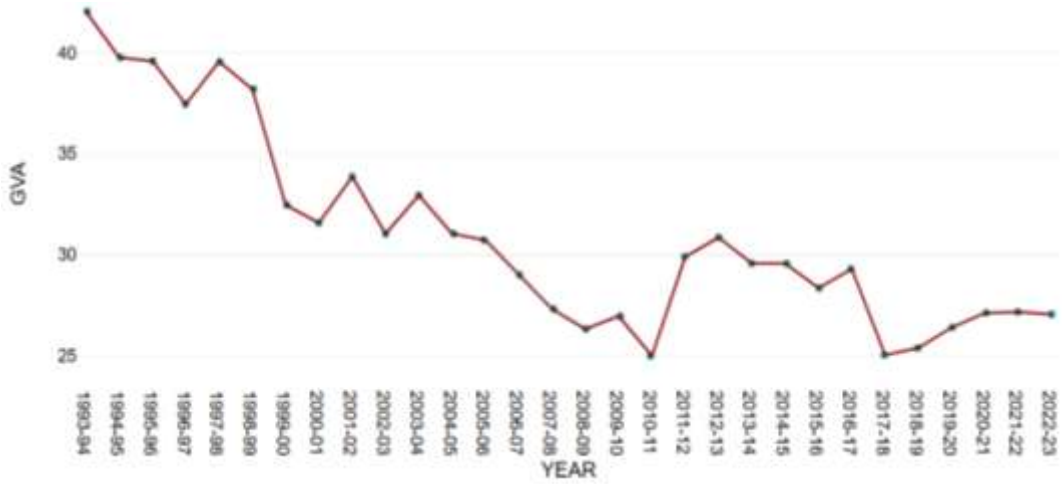

Variable	ADF	Integration Order
GSVA	p-val = 0.1772	I(1)
CAPEXP	p-val = 0.0000	I(0)

Here the Augmented Dickey Fuller results indicated GSVA is I(1) (stationary at first difference) Capital Expenditure is I(0) (stationary at level). This mix of integration order makes the ARDL approach is ideal for the analysis.

ARDL	Coefficient	P-value
Lagged GSVA	-0.1631	0.059
Long-run CAPEX	1.11e-10	0.798
Short-run CAPEX	-4.92e-12	0.917

Auto Regressive Distributed Lag Approach is used to capture both the Short-Run and Long-Run Dynamics between GSVA and Capital Expenditure. The error correction term was negative and

marginally significant (coefficient = -0.163, p = 0.059), indicating that approximately 16.3% of the previous period's disequilibrium is corrected in the current period. The error correction term is close to significant but not quite statistically strong hints that the economy tends to slowly self-correct over time but the adjustment isn't very quick or reliable in this case.

In both the long-run and short-run specifications, capital expenditure showed no statistically significant effect on GSVA. Specifically, the long-run coefficient for capital expenditure was positive but insignificant (p = 0.798), while the short-run impact was also negligible (p = 0.917). So it is safe to conclude that there is no evidence of a long-run effect of capital expenditure on GSVA at conventional levels as well indicating it does not affect GSVA in the short run either.

Bound Test	Statistic	Critical Value (5% I(0))	Critical Value (5% I(1))	P-value
F	3.901	5.387	6.366	0.127
t	-1.975	-2.953	-3.335	0.281

The bound test for cointegration further confirmed the absence of a long-run cointegration relationship between GSVA and capital expenditure. F-statistic (3.901) **is** below both the I(0) and I(1) bounds at the 5% and 10% levels. The t-statistic (-1.975) is also within the inconclusive range hence the bounds test result shows no evidence for the above said.

FINDINGS & CONCLUSION

Odisha's economy has been transitioning from agriculture-based to industry- and service-oriented sectors. This shift might lead to mismatches in employment opportunities, where new jobs created in industries or services do not align with the skills of the workforce. Though agriculture employs a large workforce, its contribution to GVA might be declining due to low productivity, lack of modernization, relatively lower wage rate or climate-related challenges.

Odisha has a dual economy where modern sectors (e.g., mining, manufacturing) are growing rapidly, while traditional sectors like agriculture are lagging. As years progress, more of the working-age population is participating in the labor force. The model implies an indirect relationship between year and Gross State Value Added through Workforce Participation Rate. Even though time directly increases Workforce Participation Rate, that increase in turn is linked with a decrease in Gross State Value Added. This inverse relationship is statistically significant, indicating that simply having more people in the workforce does not necessarily translate into higher economic output. Capital investment in agriculture leads to higher GSVA, this empirical findings challenge this notion. Without improvements in productivity and employment quality, investment alone may have limited impact. This might seem counterintuitive because one might expect that a higher participation rate could lead to greater economic output. However, this negative relationship reflects underlying complexities in the economy for instance, structural shifts, quality of employment, low productivity, lack of modernization, climate-related challenges and relatively low wage rate.

Despite substantial public investment, capital expenditure shows no significant short- or long-run effect on GSVA**.** It can be concluded that Odisha does not suffer from under investment, an insight which may also be extended in broader Indian scenario. This aligns with SEM findings, where higher workforce participation also negatively influenced GSVA**,** suggesting: Underemployment, Low capital productivity, Structural inefficiencies, underutilization and mismanagement of capital etc.

These issues may dilute the impact of financial investment on real economic output. In this context, sustainable development becomes a critical goal**.** Sustainable development is a singular term with plural essence hence true progress cannot rely solely on increased labor force participation or capital inflow. Instead, it requires- Enhance capital efficiency through monitoring and evaluation, Impact Assessment, Improving employment quality and skill development, Strengthening institutional capacity to manage and allocate capital effectively, Combine capital infusion with institutional and market support etc. Hence it can be concluded that Capital alone doesn't drive growth — the quality and effectiveness of its use matter most hence targeted policy action is of urgent need.

REFFERENCE

1.*Abdelgawwad, N. A., & Kamal, A. L. M. (2023). Contributions of investment and Employment to the agricultural GDP Growth in Egypt: An ARDL approach. Economies, 11(8), 215. https://doi.org/10.3390/economies11080215*

2.*Alaght, Y. K. (1997). INAUGURAL ADDRESS: Agricultural Investment and growth. In Ind. Jn. Of Agri. Econ. (Vol. 52, Issue 2).*

3.*Megyesiova, S. (2021). Production, employment and productivity of agricultural sector in the European Union. In Bulgarian Journal of Agricultural Science (Vol. 27, Issue No 5, pp. 846–858).*

4.Singh, Oinam & Priscilla, Laishram & Vatta, Kamal. (2022). The impact of public expenditure on agricultural growth: Empirical evidence from Punjab, India. Agricultural Economics Research Review. 34. 157-164. 10.5958/0974-0279.2021.00023.9.

5.Pacinabao, K. M. (2019, August 1). *Determinants of gross value added (GVA) of major export sectors in the Philippines*. https://sspace.snu.ac.kr/handle/10371/161767

6.Sinha, J. K. (2024). Assessing GVA contributions, FDI impact, economic growth and trade openness on agricultuural productivity in India: an ARDL approach. In *Digital Journal of Science* (Vol. 3, p. 124). https://westlandpublishers.com/uploads/file_67f43077996535.49774224.pdf
7.Nabasirye, R. (2019). Impact of Total Government Expenditure and Its Break down on Growth in Agricultural Value Added. *AgEcon Search*. https://doi.org/10.22004/ag.econ.319992
8.Kołodziejczak, W. (2020). Employment and Gross Value Added in Agriculture Versus Other Sectors of the European Union Economy. Sustainability. https://www.mdpi.com/journal/sustainability/t opical_collections/sus_rural_agri
9.Balaji, S.J. & Babu, Suresh. (2020). Agricultural Productivity, Inter-Sectoral Labor Shift, and Economic Growth in India. 10.2499/p15738coll2.133787.